

Risk Evaluation

APHIS Evaluation of the Classical Swine Fever Status of Baja California Sur, Mexico.

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Introduction

In assessing the Classical Swine Fever (CSF) status of the state of Baja California Sur (BCS), Mexico, and in accordance with its regulations [1], Aphis evaluated the following factors based on information provided by the government of Mexico:

- Authority, organization and infrastructure of veterinary services;
- Disease surveillance;
- Diagnostic laboratory capabilities;
- Disease outbreak history and disease prevalence;
- Active disease control programs, if any, if the agent is known to exist in the region;
- Vaccination status;
- Disease prevalence and outbreak history in adjacent regions;
- Separation of the region from regions of higher risks through physical or other barriers;
- Control of movement of animals and animal products from the regions of higher risk;
- Livestock demographics and marketing practices; and
- Animal health policies and infrastructure for animal disease control.

Description of the disease [2, 3]

Classical Swine Fever, previously known as “Hog Cholera” is a highly contagious disease of swine caused by a virus of the togaviridae family. The incubation period is usually 3-4 days, but may range from 2-14 days. In the typical acute form, pigs present with anorexia, fever of 41degrees C or more, muscle tremors, prostration, mucopurulent ocular discharge, and multiple superficial and internal hemorrhages, resulting in a purplish discoloration of the skin. Morbidity and mortality are high. In the final stages, nervous system involvement is manifested through nervous signs, paralysis, and death, usually in 10-15 days. A chronic form exists with milder symptoms, in which mature animals occasionally recover. Chronic CSF is characterized by prolonged and intermittent anorexia, fever, alternating diarrhea and constipation, and alopecia. The atypical form, associated with low virulence virus strains, may present in piglets as Congenital Tremor, characterized by tremors in the head, neck, dorsal area, and hindquarters. Transplacental infection with low virulence strains may result in persistently infected piglets, which are a major cause of virus dissemination to uninfected farms.

The pig is the only natural reservoir of CSF. Blood, tissues, secretions, and excretions from an infected animal contain the virus. Transmission occurs mainly through the oral route, although infection can occur through the conjunctiva, mucous membrane, skin abrasions, and inseminations. Feeding of raw or insufficiently cooked garbage containing infective pork material is a potent source of CSF virus.

Regional Risk Factors

Authority, organization and infrastructure of veterinary services [4]

A decree published in the Federal Official Daily of March 25, 1980 in Mexico established the National Campaign for the control and eradication of the CSF, and its corresponding program as general, mandatory and permanent throughout the entire country, with subsequent modifications made in decrees. The Ministry of Agriculture and Water Resources (SARH) has a state delegation in Baja California Sur. The delegation includes the livestock sub-delegation, which covers the functions of animal health, livestock development and establishing grazing coefficients. Under these are: the campaigns units, registration and zoo sanitary service units, slaughter plant inspectors; livestock development unit; livestock promotion unit; and livestock development center. The state is subdivided into four Rural Development Districts (DDR) of Mulege, Comondu, La Paz and Los Cabos all with supportive technical staff coordinated by the livestock sub-delegation. Diagnostic samples from suspicious cases of CSF are sent to the National Animal Health Diagnostic Center located in the State of Mexico. Six animal health inspection offices control the international movement of livestock and animal byproducts. Sanitary control offices exist at all airports and ports. BCS has one checkpoint with official SARH staff for control of overland movement. Hog slaughtering and processing is done in municipal facilities, which have official veterinary sanitary officers providing supervision and inspection.

Disease surveillance [4, 5]

Mexico recognized BCS free of CSF in October 1991, based on an epidemiological survey in which 524 sera and 280 tissue samples were collected from swine slaughtered in municipal abattoirs. All samples were negative for CSF virus. Sera are collected during annual surveillance to confirm the absence of CSF virus. State government livestock inspectors conduct surveillance in four municipal abattoirs. Four CSF outbreaks (one in 1993, two in 1994, one in 1995) occurred in BCS since Mexico declared the state free in 1991. Intensive surveillance was initiated after each outbreak to identify the focus and extent of the outbreak, and to confirm that depopulation of affected and exposed animals eradicated the outbreak.

Mexico has conducted a campaign against pseudorabies since 1993. Pseudorabies samples are also tested for CSF.

BCS maintains an active surveillance system includes reporting all suspected clinical cases, and sampling from commercial and backyard farms and community abattoirs. In 1997, Mexico implemented annual systematic on-farm surveillance in all free states. CPA

and SAGAR are providing sampling frames for backyard herds as well as for commercial herds. APHIS provided suggestions for sampling methodology, which were adopted in 1996. The norm given for commercial herds is that pigs are selected from each unit that is managed separately and from unrelated herds. Typically, in farrow-to-finish operations, 80 % of the samples are from sows, 10 % from boars, and 10 % from feeders over four months of age. Backyard testing guidelines require testing 5 pigs selected randomly from each backyard herd tested. Designated sites are selected randomly by the assigned veterinarian.

CSF surveillance data for BCS was analyzed to determine the most likely true prevalence of disease over the multiple years of testing data. For commercial herds, with the smaller number of total herds and animals tested, a hypergeometric probability function was used. For the more numerous backyard herds, with larger total numbers of animals tested and smaller numbers per herd, a binomial probability function was used. (See attachment 1 for details of this analysis). In both commercial and backyard herds, the most likely estimated prevalence is 0 for every year. In commercial swine, the probability of missing CSF prevalence at 1% (1 infection per 100 animals), given that no animals tested positive on surveillance during annual testing from 1997-1999, is 14%. The probability that CSF prevalence is as high as 5% (5 infections per 100 animals) and still escape detection on annual surveillance, is very low at 7.41×10^{-5} . For backyard herds, the numbers are more convincing. Analysis indicates that the probability of detecting no positive animals on annual surveys if the true prevalence was .1% or greater (i.e., the probability of missing a truly positive animal) is 1.47×10^{-3} . Therefore, if CSF was present at very low levels, or was recently introduced into backyard herds, the likelihood of detecting infection on annual surveillance is high. This analysis should not be interpreted as a higher probability of disease in commercial herds. Rather, due to the low number of commercial herds, there is less power to detect disease in routine surveillance, i.e., a higher probability of missing positive animals during surveillance if disease were present at very low levels, compared to the greater power to detect disease at low levels in backyard herds. Since the highest levels of risk of disease have historically been in backyard herds, a surveillance program, which emphasizes disease detection at low levels in backyard herds, is appropriate.

Diagnostic Laboratory Capability [4, 5]

Laboratories for CSF diagnosis include the National Center for Animal Health Diagnosis (CENASA), the laboratory of the Mexican-American Commission for the Prevention of Foot-and-mouth Disease and other Exotic Animal Diseases (CPA), and eight laboratories accredited for the diagnosis of CSF located throughout the country. All positive samples are sent to the central laboratories in Mexico City for confirmation and tissues from any suspect animal to the CPA laboratory in Mexico City for virus isolation. Both CENASA and CPA use the same tests and testing schemes.

Disease Status [5]

BCS has reported no CSF outbreaks or positive samples since 1995, and CSF is considered an exotic disease in the state.

Disease Control Program [4]

In accordance with the National Eradication Program, BCS has an active disease surveillance program, strict border controls for animal movement and an emergency response team.

Vaccination Status [4]

Vaccination against CSF has not been permitted since 1986.

Disease status of adjacent regions [4]

BCS forms the southern part of the peninsula of Baja California. To the north it is bordered by the state of Baja California, allowing for only a limited number of overland access points to the state. To the east it is bordered by the Gulf of California, and to the south and west by the Pacific Ocean. CSF is not known to exist in Baja California, the only bordering state.

Degree of separation from regions of higher risk [4]

BCS has big natural barriers: the Gulf of California to the east and the Pacific Ocean to the south and west.

Control of Animal Movement from High Risk Regions [4]

Regulations controlling the movement of all land, air and maritime traffic are the primary means for preventing the reintroduction of CSF into BCS. The entry of live hogs from CSF control zones in Mexico into free zones is not allowed. Products and byproducts from eradication or control zones to free zones must be processed and inspected by TIF establishments that are expressly authorized by the General Division of Animal Health to market their products and byproducts into CSF free and eradication zones. Transportation must be in vehicles sealed with metal straps. BCS has one checkpoint for controlling overland movement.

At airports, passenger baggage is examined and because most domestic flights originate from areas not yet declared free of CSF, food served on airplanes is not permitted to contain pork.

Pork products from regions of lower health status may be imported only if they meet time and temperature processing requirements (68.90 C for 30 minutes or 80.5⁰ C for three minutes) and if they originate from an approved TIF plant. Live hogs are imported only from free states and countries. Most replacement stock originates from Sonora [5].

Livestock demographics and marketing patterns [4, 5]

In 1994, BCS had a swine inventory of 36,901 head, distributed in the municipalities of Mulege, Comondu, La Paz, and Los Cabos. Production in 1993 was 1,033 tons. By 2000, the swine inventory for BCS had dropped to 21,773 head, of which 20,550 head were from 1,841 backyard premises. In the state there are two farms using semi-

commercial production methods, with a total population of 1,200 pigs. BCS is a net importer of swine and has no TIF facility. Nearly all swine are produced in backyard operations in which pigs are raised, slaughtered and consumed on location.

Policies and infrastructure for animal disease control [2]

Consistent with federal policy, BCS would eradicate CSF if the disease were detected.

Conclusions

- 1) CSF has not been diagnosed in BCS since 1995, despite intensive and ongoing surveillance.
- 2) No vaccination has occurred since 1986.
- 3) BCS maintains a surveillance system that is capable of detecting CSF if it should reoccur. The state's veterinary services ability to quickly detect and eradicate CSF outbreaks has been confirmed in 4 outbreaks between 1991-1995.
- 4) Given the virulent nature of the disease in this naive population, and the proven ability to detect disease if it were re-introduced, the ongoing surveillance indicates that the likelihood of CSF virus being present in the commercial swine operations of BCS is low.

References

- 1) Regionalization Final Rule, 62 FR 56000-56026; Importation of Animals and Animal Products.
- 2) Ministry of Agriculture and Rural Development. Official Mexican Standard NOM-037-ZOO-1995, National Classical Swine Fever Campaign.
- 3) Hog Cholera. In Foreign Animal Diseases, United States Animal Health Association, p. 273-282, 1998.
- 4) Report on Characterization of the State of Baja California Sur for International Recognition as a Classical Swine Fever Free Zone. Subsecretaria de Ganaderia, Direccion General de Salud Animal, Mexico, June 1994.
- 5) Additional Information Requested for the Recognition of the States of Baja California, Baja California Sur, Sinaloa, and Chihuahua as Low Risk Regions for Classical Swine Fever, 1999.

Appendix 1

Data Analysis of Commercial and Backyard Herds based on Annual Surveillance Data for CSF in the State of Baja California Sur

Baja California Sur Surveillance Information

CSF in BCS	Year	1997	1998	1999	2000
	Total Population			1222	1222
	Number of Herds			2	2
	sample size	29	29	29	29
	Total Samples (Commercial)	58	58	58	
	Presumed Prevalence=5%				
	Total Population (Back			20550	20550
	Number of Herds (Back			1841	1841
	sample size	5	5	5	5
	Total Samples (Back Yard)	2193	1688	2635	
	Presumed Prevalence=1%				
Grand Total Samples		2251	1746	2693	0
Immunoperoxidase Test	Sensitivity	0.97			
	Specificity	0.97			

Hypergeometric Probability Function of Commercial Herds

Prevalence (P)	1997 ^a	1998	1999	Total Prob ^b	1-Tot Prob ^c
0.10%	.952	.952	.952	.863	.137
1.00%	.528	.528	.528	.147	.853
2.00%	.289	.289	.289	2.41×10^{-2}	9.76×10^{-1}
5.00%	4.2×10^{-2}	4.2×10^{-2}	4.2×10^{-2}	7.41×10^{-5}	9.99×10^{-1}
(n/N) ^d	na	na	4.74%		

a: Probability of observing zero positive animals in that one survey year if the actual prevalence of CSF was P in the total population.

b: Probability of observing zero positive animals through all years of surveillance, given that there was an ongoing infection in the population of prevalence P.

c: Probability of observing one or more positive animals through all years of surveillance, given that there was an ongoing infection in the population of prevalence P; i.e., a measure of survey confidence.

d: Number of samples collected / total population in all commercial herds for that year.

Binomial Approximation to the Hypergeometric Probability Function of Backyard Herds

Prevalence (P)	1997	1998	1999	Total Prob ^a	1-Tot Prob ^b
0.10%	1.11×10^{-1}	1.85×10^{-1}	7.16×10^{-2}	1.47×10^{-3}	9.99×10^{-1}
1.00%	2.68×10^{-10}	4.29×10^{-8}	3.15×10^{-12}	3.62×10^{-29}	1.00
2.00%	5.74×10^{-20}	1.55×10^{-15}	7.60×10^{-24}	675×10^{-58}	1.00
5.00%	1.41×10^{-49}	2.50×10^{-38}	2.00×10^{-59}	7.03×10^{-146}	1.00
(n/N) ^c	7.40%	7.43%	7.16%		

a: Probability of detecting zero positive animals through all years of annual surveillance given that the true prevalence was P

b: Probability of detecting one or more positive animals in all years of surveillance given

that the true prevalence was P .

c: sample size (n) / total population in backyard herds (N) to give percent of population tested each year during annual surveillance.